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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/796,880	YUAN ET AL.	
	Examiner	Art Unit	
	Jared W. Radkiewicz	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,10,11,21,22,24,25,27,29 and 30* is/are rejected.

7)☒ Claim(s) *8,9,12-20,23,26,28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 March 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/26/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections - 37 CFR 1.75(a)

1. The following is a quotation of 37 CFR 1.75(a):

> The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

2. Claim 26 is objected to under 37 CFR 1.75(a), as failing to particularly point out and distinctly claim the subject matter which application regards as his invention or discovery. In claim 26, the words "about" and "less than" are ambiguous. Is 30 "about 25"? Is 250 "about 25"? Similarly, what is the definition of "less than 1 percent"? Are negative numbers allowable? Claim 26 should be rewritten to explicitly define the boundaries of how much the saturation levels can be varied. Proper correction is required.

Drawings

3. Color photographs and color drawings are not accepted unless a petition filed under 37 CFR 1.84(a)(2) is granted. Any such petition must be accompanied by the appropriate fee set forth in 37 CFR 1.17(h), three sets of color drawings or color photographs, as appropriate, and, unless already present, an amendment to include the following language as the first paragraph of the brief description of the drawings section of the specification:

> The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawing(s) will be provided by the Office upon request and payment of the necessary fee.

Color photographs will be accepted if the conditions for accepting color drawings and black and white photographs have been satisfied. See 37 CFR 1.84(b)(2).

Double Patenting

4. **Claims 1, 24, and 30** are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of **claim 10** of copending Application No. 2005/0200921 A1. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented. '921 claim 10 recites a computer-implemented process for correcting the exposure of improperly exposed pixels of an image ("A computer-implemented process for correcting the color of improperly colored pixels of an image"), comprising using a computer to perform the following process actions:

linearly expanding the dynamic range of the intensity levels of the image pixels so as to match the full dynamic intensity range available to a desired degree ("linearly expanding the dynamic range");

determining whether the linearly expanded intensity levels of the image pixels are evenly distributed; and whenever the linearly expanded intensity levels of the pixels are determined not to be evenly distributed, applying a correction factor to the linearly expanded intensity level of each pixel in the image to produce a corrected intensity value for each pixel and evenly distributed intensity levels ("applying the linear color correction transform to the color channel with the narrower range for each pixel of the image").

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. **Claims 1, 5, 10, 11, 24, 27 and 30** are rejected under 35 U.S.C. 102(b) as being anticipated by Lin (US 5,812,286).

Regarding **claim 1**, Lin teaches a computer-implemented (Figure 1) process for correcting the exposure of improperly exposed pixels of an image ("the system automatically looks for the appropriate correction parameters to produce images with vivid color and good contrast", Column 1 Line 48), comprising using a computer to perform the following process actions:

linearly expanding the dynamic range of the intensity levels of the image pixels so as to match the full dynamic intensity range available to a desired degree ("The underlying assumption of stretching the histogram is that the point (R.sub.max, G.sub.max, and B.sub.max) corresponds to the white point of the image, and should be rendered as white in the RGB device space of a printer or a monitor. Similarly, the point (R.sub.min, G.sub.min, and B.sub.min) corresponds to the black point of the image, and should be rendered as black in the RGB device space of a printer or a monitor.", Column 2 Line 66);

determining whether the linearly expanded intensity levels of the image pixels are evenly distributed ("a curve fit is performed for each histogram from the new maxima, minima, and median"; wherein the curve fit modifies the image only when the original image does not already fit the curve, i.e. when pixel levels are not evenly distributed; Column 3 Line 53); and

whenever the linearly expanded intensity levels of the pixels are determined not to be evenly distributed, applying a correction factor to the linearly expanded intensity level of each pixel in the image to produce a corrected intensity value for each pixel and evenly distributed intensity levels ("As described in step 40, each pixel of the image data is mapped according to the gamma curve for each channel.", Column 3 Line 46).

Regarding **claim 5**, Lin teaches the process of claim 1, wherein the process action of linearly expanding the dynamic range of the intensity levels of the image pixels, comprises the actions of:

computing a histogram of the intensity levels of the image pixels ("histogram", Column 2 Line 66);

computing the lowermost and uppermost intensity levels that are consistent with the overall distribution of intensity levels in the image ("(R:sub.max, G.sub.max, and B.sub.max) corresponds to the white point of the image, and should be rendered as white in the RGB device space of a printer or a monitor. Similarly, the point (R.sub.min, G.sub.min, and B.sub.min) corresponds to the black point of the image", Column 3 Line 3);

computing new lowermost and uppermost intensity levels that span the full dynamic intensity range available to a desired degree, and employing the originally computed lowermost

and uppermost intensity levels and the new lowermost and uppermost intensity levels to establish a linear intensity correction transform that maps the original intensity level of each pixel in the image to a linearly expanded intensity level; applying the linear intensity correction transform to each pixel of the image ("stretching the histogram", Column 2 Line 66).

Regarding **claim 6**, Lin teaches the process of claim 5, wherein the process action of computing the lowermost and uppermost intensity levels which are consistent with the overall distribution of intensity levels in the image, comprises the actions of:

computing the lowermost level as the level wherein, the sum of the number of pixels exhibiting a level within a prescribed range of levels extending from lowest level possible to the unknown lowermost level, less one level, is less than the total number of pixels in the image multiplied by a tolerance factor designed to eliminate the impact of noise on the pixels intensity values, and the sum of the number of pixels exhibiting a level within a prescribed range of levels extending from lowest level possible to the unknown lowermost level, is greater than or equal to the total number of pixels in the image multiplied by the tolerance factor; and, computing the uppermost level as the level wherein, the sum of the number of pixels exhibiting a level within a prescribed range of levels extending from the unknown uppermost level to the highest level possible is greater than or equal to the total number of pixels in the image multiplied by said tolerance factor, and the sum of the number of pixels exhibiting a level within a prescribed range of levels extending from the unknown uppermost level, plus one level, to the highest level possible is less than the total number of pixels in the image multiplied by the tolerance factor ("In practice, to reduce the effect of noise, the maximum and minimum of each color component

are chosen as the points where the cumulative histogram reaches a certain level, for example, 99.5% and 0.5% respectively.", Column 2 Line 62).

Regarding **claim 10**, Lin teaches the process of claim 1, wherein the process action of determining whether the linearly expanded intensity levels of the image pixels are evenly distributed, comprises the actions of:

computing a histogram from the linearly expanded pixel intensity levels ("histogram", Column 3 Line 19);

computing a 50 percentile (i.e., median) intensity level from the linearly expanded pixel intensity level histogram as the level wherein ("median point", Column 3 Line 20),

the sum of the number of pixels exhibiting a level within a prescribed range of levels extending from lowest level possible to the unknown median level, less one level, is less than the total number of pixels in the image multiplied by 0.5 (Figure 5), and

the sum of the number of pixels exhibiting a level within a prescribed range of levels extending from lowest level possible to the unknown median level, is greater than or equal to the total number of pixels in the image multiplied by 0.5 (Figure 5);

determining if the difference between the median intensity level and one half the maximum intensity level is less than or equal to the maximum intensity value multiplied by an intensity tolerance factor designed to compensate for the impact of noise on the pixels intensity levels ("The number 0.4 is a user defined parameter that effects the brightness when the image is produced", Column 3 Line 40); and

whenever it is determined that said difference is not less than or equal to said product, designating that the linearly expanded intensity levels of the image pixels are not evenly distributed (The designation is an inherent outcome of equation 2).

Regarding **claim 11**, Lin teaches the process of claim 1, wherein the process action of applying a correction factor to the linearly expanded intensity level of each pixel in the image to produce a corrected intensity value for each pixel and evenly distributed intensity levels, comprises the actions of:

computing a nonlinear gamma correction factor (Equation 2); and

applying the gamma correction factor to the linearly expanded pixel intensity level of each pixel in the image (Equation 4).

Regarding **claim 24**, Lin teaches a system for correcting the exposure of improperly exposed pixels of an image, comprising:

a general purpose computing device ("Microprocessor", Figure 1);

a computer program comprising program modules executable by the computing device, wherein the computing device is directed by the program modules of the computer program to,

compute a histogram of the intensity levels of the image pixels ("histogram", Column 2 Line 66),

compute the lowermost and uppermost intensity levels that are consistent with the overall distribution of intensity levels in the image ("(R.sub.max, G.sub.max, and B.sub.max) corresponds to the white point of the image, and should be rendered as white

in the RGB device space of a printer or a monitor. Similarly, the point (R.sub.min, G.sub.min, and B.sub.min) corresponds to the black point of the image", Column 3 Line 3),

compute new lowermost and uppermost intensity levels that span the full dynamic intensity range available to a desired degree, and employ the originally computed lowermost and uppermost intensity levels and the new lowermost and uppermost intensity levels to establish a linear intensity correction transform that maps the original intensity level of each pixel in the image to a linearly expanded intensity level, apply the linear intensity correction transform to each pixel of the image ("stretching the histogram", Column 2 Line 66),

determine whether the linearly expanded intensity levels of the image pixels are evenly distributed (The designation is the outcome of equation 2), and

whenever the linearly expanded intensity levels of the pixels are determined not to be evenly distributed, employing a gamma correction factor to the linearly expanded intensity level of each pixel in the image to produce a corrected intensity value for each pixel (Equations 2 and 4).

Regarding **claim 25**, Lin teaches the system of claim 24, further comprising a program module for, whenever the application of a gamma correction factor to the linearly expanded intensity level of each pixel in the image results in an overall brightening of the image ("The number 0.4 is a user defined parameter that effects the brightness when the image is produced. A larger value results in a lighter image.", Column 3 Line 40), boosting the color saturation levels

of each color channel of each pixel of the image by a desired amount (Figure 4 shows independent operation on each color channel).

Regarding **claim 27**, Lin teaches the system of claim 24, wherein the program module for employing a gamma correction factor to the linearly expanded intensity level of each pixel in the image to produce a corrected intensity value for each pixel, comprises sub-modules for:

computing a nonlinear gamma correction factor (Equation 2); and

applying the gamma correction factor to the linearly expanded pixel intensity level of each pixel in the image (Equation 4).

Regarding **claim 30**, Lin teaches a computer-readable medium having computer-executable instructions for performing the process actions recited in claim 1 (Lin's process runs on a "microprocessor" as seen in Figure 1 inherently employing a computer readable medium).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. **Claims 2 and 3** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US 5,812,286) in view of Hyodo (US 6,018,589).

Regarding **claim 2**, Lin teaches claim 1.

Lin Does not teach the process of claim 1, wherein the process action of linearly expanding the dynamic range of the intensity levels of the image pixels so as to match the full dynamic intensity range available to a desired degree, comprises an action of varying the degree to which intensity levels of the image pixels are made to match the full dynamic intensity range available between expanding the dynamic range of the intensity levels to match the full dynamic intensity range available to no expansion at all, depending on the value of a safeness parameter.

Hyodo teaches using a threshold to determine minimum and maximum values more restrictive than absolute minimum and maximum values used for histogram operations (Hyodo Figure 3 show a 1% threshold, for example)

It would have been obvious at the time of invention to one of ordinary skill in the art to provide the invention of Lin with modified minimum and maximum values as demonstrated by Hyodo to simplify calculations ("As a result, when the histogram is made, a counter which has a small counter value can be used", Hyodo Column 2 Lines 22-23) and "to reduce the effect of noise" (Lin Column 2 Line 62).

Regarding **claim 3**, Lin and Hyodo teach the process of claim 2 wherein the threshold is prescribed (Hyodo Figure 3 shows a fixed 1% threshold)

9. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US 5,812,286) and Hyodo (US 6,018,589) in further view of Iguchi et al. (US 2001/0007599 A1).

Regarding **claim 4**, Lin and Hyodo teach claim 2.

Lin and Hyodo do not teach the process wherein the user supplies the safety parameter.

Iguchi teaches a histogram modifying process operating on a computer with a user interface (Figure 1 shows a "host computer" with human interface features to interact with a "user", Iguchi Paragraph 53).

It would have been obvious at the time of invention to one of ordinary skill in the art to provide the invention of Lin and Hyodo with a user specified parameter as enabled by Iguchi to give the user control over the output at runtime.

10. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US 5,812,286) in further view of Gindele et al. (US 2003/0228064 A1).

Regarding claim 7, Lin teaches claim 5.

Lin does not teach the process of claim 5, wherein the process action of linearly expanding the dynamic range of the intensity levels of the image pixels so as to match the full dynamic intensity range available to a desired degree, comprises an action of varying the degree to which intensity levels of the image pixels are made to match the full dynamic intensity range available between expanding the dynamic range of the intensity levels to match the full dynamic intensity range available to no expansion at all, depending on the value of a safeness parameter.

Gindele teaches the process of claim 5, wherein the process action of linearly expanding the dynamic range of the intensity levels of the image pixels so as to match the full dynamic intensity range available to a desired degree comprises an action of varying the degree to which intensity levels of the image pixels are made to match the full dynamic intensity range available between expanding the dynamic range of the intensity levels to match the full dynamic intensity

range available to no expansion at all, depending on the value of a safeness parameter ("The third histogram is then stretched (when the resizing factor is greater than 1.0) or compressed (when the resizing factor is less than 1.0) with respect to the variable x to produce a fourth histogram H.sub.4(x) such that H.sub.4(x)=H.sub.3(.alpha.(x-x.sub.o)) and x.sub.o represents a reference gray pixel value (x.sub.r) that remains constant through the transformation.", Gindele Paragraph 106).

It would have been obvious at the time of invention to one of ordinary skill in the art to provide the invention of Lin with the variable histogram stretching of Gindele to utilize the entire dynamic range available.

11. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US 5,812,286) in further view of Liu et al. (2004/0190789 A1).

Regarding **claim 21**, Lin teaches the process of claim 11.

Lin does not teach the process of claim 11, wherein the process action of applying the gamma correction factor to the linearly expanded pixel intensity level of each pixel in the image, comprises an action of applying the gamma correction factor to each linearly expanded pixel intensity value such that $\hat{I} = \left(\frac{I}{L-1}\right)^{\gamma}(L-1)$, wherein $\hat{I}$ is the corrected pixel intensity value, I is the linearly expanded pixel intensity value, γ is the correction factor, and L is the maximum possible intensity level.

Liu teaches the process of claim 11, wherein the process action of applying the gamma correction factor to the linearly expanded pixel intensity level of each pixel in the image,

comprises an action of applying the gamma correction factor to each linearly expanded pixel intensity value such that $\hat{I} = \left(\frac{I}{L-1}\right)^{\gamma}(L-1)$, wherein $\hat{I}$ is the corrected pixel intensity value, I is the linearly expanded pixel intensity value, γ is the correction factor, and L is the maximum possible intensity level (Liu Equation 7 is mathematically equivalent provided alternate definitions of L and γ).

It would have been obvious at the time of invention to one of ordinary skill in the art to provide the invention of Lin with the gamma correction factor of Liu to compensate for exposure with a "gradual brightness reduction approach" (Liu Paragraph 78).

12. **Claim 22** is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US 5,812,286) and Liu et al. (2004/0190789 A1) in further view of Kuo et al. (US 5,982,926).

Regarding **claim 22**, Lin and Liu teach claim 21.

Lin and Liu do not teach claim 21, further comprising a process action of, whenever the application of a gamma correction factor to the linearly expanded intensity level of each pixel in the image results in an overall brightening of the image, boosting the color saturation levels of each color channel of each pixel of the image by a desired amount.

Kuo teaches claim 21, further comprising a process action of, whenever the application of a gamma correction factor to the linearly expanded intensity level of each pixel in the image results in an overall brightening of the image, boosting the color saturation levels of each color channel of each pixel of the image by a desired amount ("The image is enhanced by applying a first transformation function to the intensity components of the image and a second

transformation function to the saturation components of the image", Kuo Column 2 Lines 14-17).

It would have been obvious at the time of invention to one of ordinary skill in the art to provide the invention of Lin and Liu with the color saturation boost of Kuo to ""provide an enhanced image having fully optimized intensity and saturation components" (Kuo Column 2 lines 24-26)

13. **Claim 29** is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US 5,812,286) in further view of Liu et al. (2004/0190789 A1).

Regarding **claim 29**, Lin teaches the process of claim 27.

Lin does not teach the process of claim 27, wherein the process action of applying the gamma correction factor to the linearly expanded pixel intensity level of each pixel in the image, comprises an action of applying the gamma correction factor to each linearly expanded pixel intensity value such that $\hat{I} = \left(\frac{I}{L-1}\right)^{\gamma}(L-1)$, wherein $\hat{I}$ is the corrected pixel intensity value, I is the linearly expanded pixel intensity value, γ is the correction factor, and L is the maximum possible intensity level.

Liu teaches the process of claim 11, wherein the process action of applying the gamma correction factor to the linearly expanded pixel intensity level of each pixel in the image, comprises an action of applying the gamma correction factor to each linearly expanded pixel intensity value such that $\hat{I} = \left(\frac{I}{L-1}\right)^{\gamma}(L-1)$, wherein $\hat{I}$ is the corrected pixel intensity value, I

is the linearly expanded pixel intensity value, γ is the correction factor, and L is the maximum possible intensity level (Liu Equation 7 is mathematically equivalent provided alternate methods of calculating L and γ).

It would have been obvious at the time of invention to one of ordinary skill in the art to provide the invention of Lin with the gamma correction factor of Liu to compensate for exposure with a "gradual brightness reduction approach" (Liu Paragraph 78).

Allowable Subject Matter

14. **Claims 8, 9, 12-20, 23, 26, and 28** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 8 is objected to as being dependent upon a rejected base claim, but would be otherwise allowable because the step of computing the uppermost intensity level by the specific equation of claim 8 is not covered by the prior art of record, nor is there sufficient motivation to combine any of the prior art of record to reject the claim.

Claim 12 is objected to as being dependent upon a rejected base claim, but would be otherwise allowable because the claim provides sufficient detail to overcome the prior art of record, specifically in the calculation of the correction factor by the equation specified by claim 12 and the multiple prescribed parameters involved therein.

Claim 28 is objected to as being dependent upon a rejected base claim, but would be otherwise allowable for the same reasons as claim 12, as claim 28 is substantially equivalent to claim 12.

Claim 23 is objected to as being dependent upon a rejected base claim, but would be otherwise allowable because the step of computing the color saturation boost factor by the specific equation of claim 23 is not covered by the prior art of record, nor is there sufficient motivation to combine any of the prior art of record to reject the claim.

Claims 9 and 13-20 are dependant on an objected to but otherwise allowable base claim, and are therefore also objected to but otherwise allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jared W. Radkiewicz whose telephone number is (571) 270-1577. The examiner can normally be reached on 8:00 - 5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian P. Werner can be reached on (571) 272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JWR

/Brian P. Werner/
Supervisory Patent Examiner (SPE), Art Unit 2624